

#### 4.SUB-TOPIC AREA: WEATHER AND CLIMATE

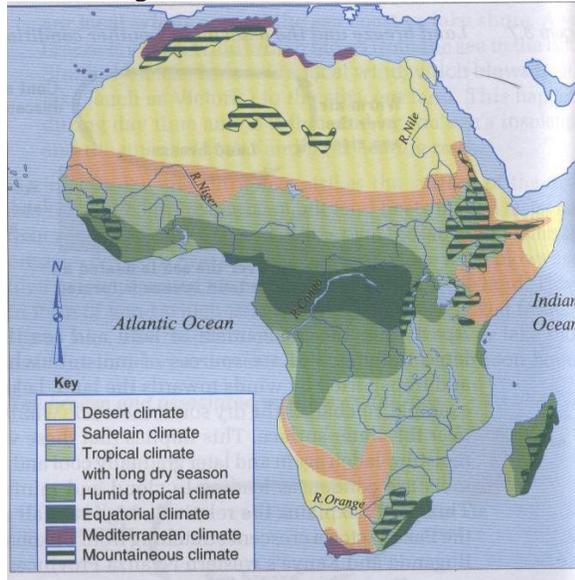
#### UNIT 4: CLIMATE IN AFRICA AND THE WORLD

##### 1. Introduction

The climate refers to the average weather conditions of the atmosphere over a long period of time. It is the average weather conditions at a given place.

##### 2. Climate of Africa

Different parts of Africa experience different climatic conditions due to large differences in latitude, altitude, huge mass of its land and different ocean currents which flow near the coast.



**Fig 3.7 Climatic regions of Africa**

- **Equatorial climate:** this climate is found in areas close to Equator within 5° South and 5° North. Those areas include much of Congo basin, the West African coast, and parts of Gabon, Equatorial Guinea and Cameroon. In East Africa, this climate is reduced by the factors of altitude and relief. However, equatorial climate is found in areas such as Lake Victoria shores and islands, highlands and Zanzibar islands. **The characteristics of equatorial climate are:**

- High mean annual temperature of about 27°C
- Uniformly high temperature with only a small annual range of about 3°C
- High relative humidity of about 80%
- Abundant rainfall of 2000mm on average
- Double maxima rainfall; two peaks of rainfall exist usually around April and October each year
- Rainfall is accompanied by thunder and lightning
- Absence of distinct dry season

- **Savannah climate:** this is the most widespread climatic type in Africa. This climate is found in the south of the Sahara and Sahel region in West Africa, East and central Africa outside the Congo basin and major highlands. **The characteristics of this climate are:**

- Moderate rainfall usually between 760-1500mm
- The amount of rainfall varies from place to place. Places near Equator, especially near water bodies and highlands receive higher rainfall
- The rainfall is seasonal and in most cases characterized by one wet season and one dry season
- The temperature are high throughout the year
- High temperature range compared to the equatorial climate
- high relative humidity

- **Arid and semi-arid climate:** Africa is the home to the world largest desert: the **Sahara**. The Namib Desert is found in Namibia along the coast. The Kalahari semi-desert is an eastward extension of the

Namib Desert and occupies much of Namibia, Botswana and the north-western part of the Republic of South Africa.

**Characteristics of this climate are:**

- Low relative humidity usually less than 25%
- Limited cloud cover or even clear skies
- Very low rainfall usually less than 760mm
- High day-time temperatures and low temperature at night
- High diurnal temperature range
  - **Mediterranean climate:** this is known as warm temperate **western margin**. Areas experiencing this climate in Africa include south-west of the Republic of South Africa (Cape Town area), the coast of Morocco, Algeria and the Benghazi area of Libya. **This climate is characterized by:**
- Wet winters (rain fall is received in winter due to onshore winds in that season and offshore winds in summer).
- Dry summers
- Warm to hot summers
- Cool to mild winters
  - **Montane climate:** this is experienced on the high mountains. The high grounds of Africa which have various micro-climates include the Atlas, Drakensberg, Adamawa and Ethiopian highlands. In East Africa, notable examples are Mount Rwenzori, Mount Kenya, Mount Kilimanjaro, Mount Elgon and Mount Muhabura (Rwanda). **The main characteristics of mountain climate include:**
- Very low temperature near and at the tops of the mountains
- Decrease in atmospheric pressure as altitude increases
- Relief rainfall on the windward side
- Dry leeward side

### **3. Climate of other continents**

#### **a. EUROPE**

The climate

The continent of Europe stretches from northern mid latitudes to the polar region:

- The Mediterranean climate : southern part of Europe;
- The warm temperate coastal climate: experienced in Western Europe, in the British Isles, the Rhine lands, southern parts of Scandinavian countries;
- The warm temperate continental climate: S.E Europe, Balkan states, south central Russia. It is characterized by hot summers and cool winters;
- The cool temperate interior climate: Central Europe, over the Scandinavian countries, most of Northern Russia. It is known for its mild summers and cold winters;
- The tundra climate: polar north, cold summers and cold winters.
- \* Desert vegetation or dry steppe: temperate desert vegetation around the Caspian Sea. It is a cold desert. There is mostly desert shrub.

#### **a. AMERICA**

The major climatic types found in North America include: Desert and semi-desert climate, western margin, Montana climate, Warm temperate Interior (Continental), Cool temperate western margin (West Coast), Warm temperate eastern margin, cool temperate eastern margin, cold temperate interior, cool temperate interior (Continental), Tundra, Polar climate.

#### **C. ASIA**

The cold Tundra of the Polar North, the hot, dry desert of the central and south-west, and the hot, humid of the tropical south.

Factors influencing the climate Asia: continentality, High mountains, Monsoon winds, latitude, longitude and the adjacent water bodies.

#### **b. OCEANIA**

i) With the exception of New Zealand and Easter Island, the Pacific Islands lie within the rainy tropics or the humid subtropics. In such areas there are no abrupt seasonal changes as occur in regions of temperate climate. Temperatures typically average close to 27° C (80° F) most of the year. At higher elevations, temperatures typically drop at the rate of 1.7° C (3° F) for every rise in elevation of 300 m.

ii) In parts of the central and western Pacific, monsoon climates prevail. In monsoon climates, moisture-bearing winds reverse direction once a year, creating a distinct wet season and a dry season. Because of monsoon conditions and differences in elevation, amount of rainfall, seasonal and annual, varies greatly from island to island and even on different parts of larger islands. The windward (usually eastern) slopes of the high islands sometimes receive as much as 6400 mm (250 in) of rainfall annually. The leeward (usually western) slopes of these islands are relatively dry.

iii) In the area from about 30° north of the equator to about 30° south of the equator, the westward-moving trade winds prevail. Centuries ago these steady winds carried the sailing vessels of European traders, hence their name. Where the northern and southern trade winds meet near the equator they cancel each other out, creating the doldrums, a region of little or no wind more formally called the intertropical convergence zone (ITCZ).

iv) The western Pacific is also a breeding ground for tropical cyclones, which are called typhoons in some areas and hurricanes in others. North of the equator most such storms occur between July and November. South of the equator the stormy season begins about November and ends about March. The heavy wind and rains brought by these storms often causes devastating loss of life and property.

### **4. RELATIONSHIP BETWEEN CLIMATE AND HUMAN ACTIVITY**

**a) Positive aspect:** Climate as well, influences our day-to-day life as it gives us various opportunities for development.

1. **High and reliable rainfall** favours agriculture, moderate to heavy rainfall: coffee & banana, cool temperature for wheat

2. **Moderate or abundant rainfall** support grass which livestock can feed on as pasture

3. Heavy rainfall supports the growth of trees and thus forest existence (lumbering & forestry activities)

4. **Tropical warm and sunny climate** is attractive to European and North American tourists especially when it is winter time in their countries of origin (tourism industry earning of foreign exchange).

5. **Human activities** such agriculture depend on good climate.

6. **Fishing** influenced by climate because the continued existence of wetlands and other water bodies is supported by the availability of rainfall.

7. **Favourable climates** have led to the occurrence and presence of many features such as forest, grasslands, wetlands and water bodies that form tourist attraction sites, but tourist can destroy the environment if they leave fire.

8. **A good climate** with reliable rainfall supports mining especially of alluvial mineral deposits

9. **Industrialization** is affected by climate such agro-industry depend on good climate with reliable rainfall

11. **Settlement of all kinds** both in rural and urban areas are influenced by climate (favourable climate).

**b) Negative aspects:** Climatic conditions can, however, be a problem to development

1. **Excessive rainfall** may lead to flooding in low-lying areas (loss of life & destruction of properties)

2. **Dry hot climatic conditions** discourage the activity of cultivation (crops requiring abundant water may not be successfully grown in arid and semi-arid lands without irrigation)

3. **Much tropical rainfall** reduces the lifespan of roads, roads develop potholes and gradually deteriorate, this raises maintenance costs.

4. **Certain vectors** thrive best in hot tropical climatic conditions: mosquitoes and tsetse flies (malaria & sleeping diseases) are fundamentally tropical diseases
5. **Wind uproots** the trees and destroys properties, ...

## 5. SUB-TOPIC AREA: VEGETATION

### UNIT 5: VEGETATION OF AFRICA AND THE WORLD

#### 1. Introduction

Vegetation refers to a set of natural or planted plants which grow on a given surface of land, that is, in a given environment. Plants that cover the earth's surface. Community of plants. All plants considered broadly are known as vegetation. **Natural vegetation** refers to plants whose growth is not a result of human activities but a product of natural processes and factors. **Human induced** or **artificial vegetation** refers to plants whose growth and development have been influenced by human beings.

#### 2. Types of natural vegetation Africa/Vegetation of Africa

+ **Tropical rainforest vegetation**: this vegetation is found where the tropical equatorial climate is experienced. It is found in Congo basin, Sierra Leone, Ivory Coast, Equatorial Guinea and Gabon. In East Africa, the tropical rainforest is found around the Lake Victoria shores and islands, the highland areas and the coastal strip. This forest has the following characteristics:

- Closely packed tall rising trees to an average height of 50m
- Trees occur in **mixed stands**, meaning that different tree species grow next to each other
- Climbing plants, lianas (plants needing trees for support) and epiphytes (parasitic plants) occur amidst (between) the bigger trees.
- Occurrence of broad-leaved and evergreen trees
- Limited or absence of undergrowth (shorter or smaller plant communities) between the bigger trees
- Trees have developed buttress roots
- Trees branches are in layers (stratification). Three layers can be identified.

+ **Savannah woodland**: the woodland vegetation is characterized by:

- More or less continuous cover of trees; 8-16m tall
- Trees have bushy spreading tops
- Some trees shed their leaves during the dry season; hence are **deciduous**
- Dense undergrowth (the growth of shorter trees, bushes and grasses between taller trees)

+ **Savannah grassland**: this is the most widespread type of natural vegetation in Africa. It can be found in the interior of plateau of Kenya, Uganda and Tanzania. Areas of Bugesera and Akagera national park are known for their savannah grassland vegetation. The characteristics are:

- Relatively tall grass of about 1m on wet margins
- Occasional tall elephant grass of about 3 to 4m
- Scattered and widely spaced trees
- Scattered bushes

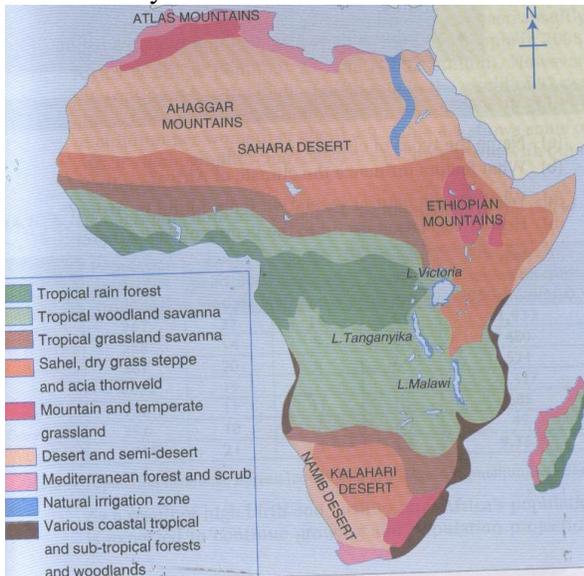
+ **Desert and semi-desert vegetation**: this vegetation is widespread over Sahara and Namib Deserts and Kalahari semi-desert. The vegetation has the following characteristics:

- Very short and widely spaced trees
- Very short grass (bare surface on very dry margins)
- Drought-resisting plants such as the cactus
- Plants with long and spreading roots to tap scarce water
- Plants with small, few and shiny leaves to minimize transpiration and reflect insolation
- Some plants have spines instead of ordinary leaves as a protective measure against herbivorous animals.

+ **Mediterranean vegetation**: this is found along the Algerian, Tunisian and Moroccan coasts. It is also found around Benghazi (Libya) and Cape Town (Republic of South Africa).

Major characteristics are:

- Trees with shiny and waxy leaves (to reduce transpiration and conserve limited water supply)
- Trees with thick bark (like cork oaks)
- Long tap roots that extend to great depths in the soil in search of water
- Certain plants with fleshy bulbous roots able to store water
- + **Montane vegetation (mountain/highland vegetation)**  
This is vegetation found on high mountains which include Rwenzori, Elgon, Muhabura and Kilimanjaro. Plants are adapted to cold climatic conditions. The main characteristics include:
  - Occurrence of sheath and moor plant species
  - Growth of short grasses
  - Growth of scattered low shrubs
  - Occasional sprouting of flowering plants
  - Absence of trees at or near the mountain summit (top) where temperature is less than 6°C for most of the year
- + **Wetland (swamp) vegetation:** this vegetation is found along the continent's coastal strip as along sections of river valleys such as Nile, Nyabarongo as well as on the shores of lakes such as Victoria, Edward, Albert, Kyoga and Tanganyika. The main characteristics are:
  - Papyrus plants
  - Mangrove plants (trees growing in muddy and shallow water with roots growing from their branches into the water)
  - Floating aquatic vegetation such as water lilies
  - Plants usually have short roots since water is available at or near the earth's surface



**Fig 3.9 Natural vegetation in Africa**

#### **Factors affecting distribution of natural vegetation**

- + **Climate:** rainfall and temperature are the main climatic elements which influence the type of vegetation. Abundant rainfall produces forest.
- + **Soil:** deep and rich loam soils on the gentle slopes support the growth of tall trees.
- + **Relief:** high rate of erosion on steep slopes results into thin soils while gentle slopes have thick or deep soils. Consequently grass may grow on steep slopes but trees and other forms of luxuriant vegetation will tend to grow on the gentle slopes.
- + **Drainage:** on flat or low lying areas where water is not freely flowing, that is where water is stagnant, drainage is said to be **poor** or **imbedded**. This leads to the growth of water-loving plants such as **water lilies, mangrove** and **papyrus**. Such areas are known as **swamps** or **wetlands**.



**Fig 3.8 Papyrus**

+ **Role of animals:** insects such as locusts and grasshoppers, wild herbivorous animals like large herds of elephants and large numbers of birds are examples of animals that may lower the quality of natural vegetation through their feeding patterns. When the number of herbivorous exceeds the land carrying capacity (the capacity of land to support living organisms on a given area), the existing vegetation will be destroyed through **overgrazing**. However, **Tsetse** flies protect the vegetation by preventing animals to make it a habitat!

+ **Human activities:** human activities include the grazing of domestic animals, burning, deforestation and reclamation projects.

### **Importance of vegetation**

1. **Soil conservation:** Control soil erosion caused by raindrops, running water or strong wind
2. **Rainfall formation:** Trees transpire and release vapour into the atmosphere (evapo-transpiration)
3. **Wildlife habitat:** Forest/vegetations are home of various types of animals
4. **Source of oxygen:** Vegetation contributes oxygen which is needed by human beings
5. **Provision of food:** Some forest plants contain edible parts eg : mangoes trees,...
6. **Provision of building materials:** only from trees that timber and poles for construction are obtained
7. **Provision of charcoal and firewood:** Trees are cut down and processed to make charcoal and tree trunks and branches are also used as firewood.
8. **Source of medicine:** Traditional and modern medical systems in many part of the world are based on plants.
9. **Scientific Research:** Human kind is continually seeking to find more about the environment in an effort to improve people's lifestyles.
10. **Tourism:** Cool forest environment with a variety of plants communities is source of pleasure to some people interested in observing nature in its real form.
11. Employment opportunity and foreign exchange
12. **Art, craft & culture:** In some part of the world, trees are used to make items of art and craft such as local tools
13. **Trees provide protection of settlements** against whirl/strong wind which would otherwise destructive
14. **Manufacture of paper:** Soft wood trees are significant as they are processed into paper products.

### **NEGATIVE EFFECTS OF VEGETATION:**

1. Difficulties in the establishment of infrastructure, in dense vegetation and impenetrable forests makes construction of transport and communication routes difficult and more costly.
2. Pests and diseases, vegetation such as forests harbour dangerous pests and diseases which affect people leaving near them.
3. Species of less economic value
4. Obstacle to settlements
5. Wild animals
6. Hide-outs, forested areas and other bushy parts of the country act as hide-outs for criminals who interfere with peace and order in the neighbouring communities and act as short –cuts for illegal trade eg: *kanyanga*.
7. Socio-economic barriers, vegetation in the form of forests act as barriers between various communities especially those that live on opposite sides of the forested areas, communication between the two areas is hindered.

### **3. Major type of vegetation in other continents**

#### **a. EUROPE**

The types of vegetation include:

- \* Mediterranean vegetation: mostly wood land and shrub. It referred to as maquis or garrigue, it is found in southern regions bordering the Mediterranean Sea.
- \* Deciduous forest: western Europe; forests shed their leaves during the winter season;
- \* Coniferous forest or taiga: composed of thin leaved conifers that are evergreen: Northern Europe (Sweden, Finland) Eastern and Northern Russia;
- \* Cool grasslands or temperate steppes: short grass with little or no trees: central and Eastern Europe;
- \* The arctic tundra: stunted vegetation and barren lands: Norway and Extreme North of Russia;
- \* Desert vegetation or dry steppe: temperate desert vegetation around the Caspian Sea. It is a cold desert. There is mostly desert shrub.

#### **b. AMERICA**

**North America:** Temperate deciduous forests, tropical evergreen forests, Mediterranean forests, temperate grass land, semi-desert and shrub, tundra.

**South America:** Coating: White forest, tropical deciduous forests, temperate rainforests, south Brazilian forests, Xerophytes association, and mountain vegetation.

#### **c. ASIA**

Asia incorporates many different biomes, which are landscapes having similar combinations of climate, vegetation, and animal life.

The northernmost areas of Asia, which experience a subpolar climate, have tundra vegetation consisting of grasses, mosses, and other small plants. Farther inland from the Arctic coast, the tundra gives way to the taiga, a region of vast coniferous forests composed of trees such as spruce, larch, and fir. Farther south, the taiga merges with forests of broadleaf trees, or mixed forests of broadleaf and needleleaf trees.

In Asia's north central interior the forests merge into vast grasslands, much of which is short, steppe grasses. Large portions of Southwest Asia and the continent's interior have semiarid or desert vegetation. Short grasses and other vegetation that require minimal precipitation surround many of the most barren areas in the deserts.

Although tropical rain forest predominates along the southern coastal strip and on the island of Sri Lanka, the eastern side of South Asia is characterized by semiarid tropical vegetation. The Deccan Plateau has mainly tropical dry forest vegetation.

Mainland and island Southeast Asia once supported extensive areas of tropical rain forest, which thrived in the warm, moist climate. Significant tracts of forest remain in most countries, but legal and illegal harvesting are too rapid to support sustainable regrowth.

Inland from the coastal strips of mainland Southeast Asia and stretching into southern China, tropical seasonal forests predominate. These merge into temperate forests farther north. Around the rim of the Bo Hai gulf the vegetation is chaparral, woody shrubs that grow to 4 m in height.

#### **d. OCEANIA**

The vegetation of the Pacific Islands varies by island type. The continental islands have vegetation typical of tropical climates: Mangrove forests rim the island, further inland lie nipa and other palms, and the interior is typically rain forest or monsoon forest. At higher elevations are temperate forests, including pine trees. The highest elevations of New Guinea even have alpine forests. In some areas of continental islands and larger volcanic islands, soil fertility can be high, especially in river basins and deltas.

### **4. RELATIONSHIP BETWEEN VEGETATION AND HUMAN ACTIVITY**

1. **Forestry:** Science of managing forests=uses of trees in different activities eg : lumbering, timber, poles,...

2. **Charcoal burning** and **firewood** collection as source of energy.

3. In grassland environments, the available **grass** is used as pasture for herbivorous animals: **pastoralism**(goats, sheep, cattle,...)

4. Unique high altitude vegetation and mountains slope vegetation tends to be a source of curiosity, this leads to the growth of **tourism industry**.

## 6.SUB-TOPIC AREA: DRAINAGE

### UNIT 6: DRAINAGE IN AFRICA

#### 1.Introduction

**Drainage** refers to the total network of water bodies over the surface of the earth. These include lakes, rivers, canals, springs and swamps. It is the general distribution of surface water. A **drainage system** is the layout or actual plan made by the river and its tributaries on the landscape. A **drainage basin** is therefore a low-lying area drained by either a lake or a river.

#### 2. Major rivers and lakes in Africa

**River** : water flowing in a definite channel towards a lake or sea e.g. Nyabarongo river, Akagera. There are thousands of rivers originating from the continent's uplands. The Nile is the longest while Congo is the largest of African rivers. Other important rivers include Zambezi, Niger, Limpopo, Volta and Orange. Africa's bigger rivers reach a river's normal destination (sea). Nile, Congo and Orange are examples. However, some smaller ones are unable to reach the sea and instead flow into lakes. The situation by which a river does not reach the sea but flows into lakes is called **inland drainage**. Notable examples of inland drainage include Lake Chad, Okavango swamp lands (Botswana) and Lake Magadi (Kenya). Most of the lakes in Africa are located in Eastern Africa west of and around Africa's Great Rift Valley: **The eastern Rift branch** contains lakes Magadi, Nakuru, Naivasha, Elementeita, Bogoria and Turkana while **the western Rift branch** consists of Lake Tanganyika (1470m deep; the first in depth in Africa, the second in the world after Baikal in Russian Federation), Lake Malawi, Albert, Kivu, George, Rukwa and Eduard. Lake **Victoria** (68500km<sup>2</sup>) is the largest lake in Africa. It does not lie in the rift valley but it is located between its main valley and the western branch and for this reason it is called a lake of **warping**. The Lake Chad is shared by Niger, Chad, Cameroon and Nigeria.

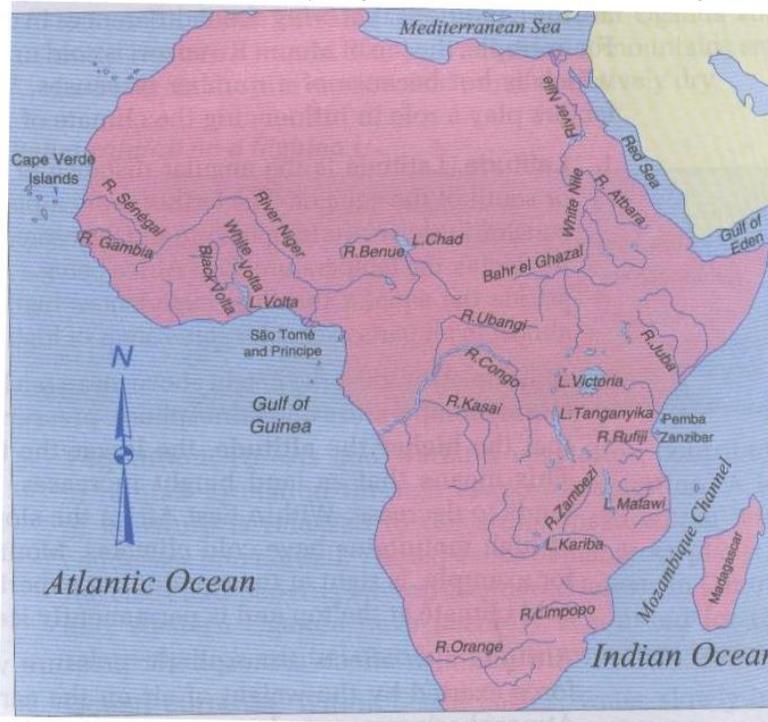


Fig 3.4 Major drainage features

#### Major drainage basins of Africa

Drainage refers to the total network of water bodies over the surface of the earth. This includes lakes, rivers, canals, springs and swamps. A drainage basin is therefore a low-lying area drained by either a lake or a river. In Africa, the major lake basins include the Victoria basin, the Chad basin, and other smaller bodies drained by smaller lakes. The river basins are the low-lying areas drained by

ivers. Drainage basins are separated by highlands called divides The major river basins in Africa include the Congo basin, The Nile basin and Nyabarongo basin (Rwanda )..

**The congo basin:** This basin drains from Bunia highlands of East African rift valley, Lake Tanganyika, Mweru as Lualaba river. The basin is drained by the Chambezi Lomani at Kisangani .It joins with R. Ubangi at Kinshasa to Matadi, Boma and the Atlantic Ocean.

**The Niger basin :** This basin is West Africa’s longest river.It flows from Guinea highlands through Mali, Niger ( on the border with Benin ) then through Nigeria to the Niger delta and to the Atlantic Ocean

**The Nile basin :** The basin covers D.R Congo, Kenya , Uganda, Tanzanie,Rwanda, Burundi,Sudan, Ethiopia as well as Egypt.The white Nile rises in the Southern Rwanda, flows Northwards to Tanzania ( Kagera ) into L. Victoria, kyoga (Victoria-Nile ) into L. Albert, Albert Nile into Southern Sudan. The Blue Nile starts from Lake Tana in Ethiopia and flows into Sudan,where it joins the White Nile near Khartoum

**The Nyabarongo basin.:** River Nyabarongo is the single longest river in Rwanda.It a flows from the highlands of Gahinga / Muhabura mountains to form R. Mukungwa in Nyabihu regions. It is joined by tributaries from Mutaza hills in the west. The river flows southwards to Gakenke and splits into two distributaries, one flows south of Kigali to L. Mugesera plains into R. Rweru on the border with Burundi. Another tributary flows southwards.It is joined by R. Mbirurume,Rukarara from the Nyamasheke highlands.It develops several distributaries in Nyamagabe, Huye region in the Nyanza plateau.

### 3. Major lakes of Africa and their mode of formation

#### 1°Definition

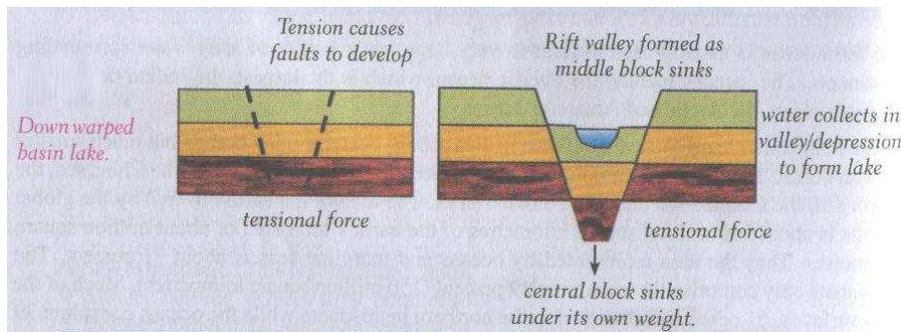
A lake is hollow or depression in the earth’s surface containing water .It is more or less large and deep areas of water found inside the mainland ( continent ) . Lakes can be temporary or permanent .

#### 2°Types of lakes ( modes of lakes formation )

\*I Tectonic ( Earth movement ) lakes

a) Down warped basin lakes : These are which occupy down warped depressions. Examples include lakes Victoria and kyoga.

b) Fault lakes ( Rift Valley lakes ): These are formed when depressions on the rift valley floor are filled with water ana become sites of lakes, after faulting.Examples include lakes Tanganyika, Albert, Magadi , Kivu, Edourd, Turkana and several others



\* II° Glacial Lakes : these are formed due to erosion and deposition by glaciers They include :

- Cirque Lakes (Tarns ): these form when a depression ,created by glacial erosion in highland areas is filled with water as the glacial melts ;E.g Michelson and Teleki on Mt Kenya, Mahoma on Mt

Ruwezori .

- Rock basin lake: these are formed when unequal vertical glacial erosion within the U-Shaped Valley leads to formation of rock basins which become sites of lakes when the soft rocks are eroded on the valley floor . E.g. Lac'duspeke in the upper Mobuku Valley on Mt Ruwenzori .

- Ribbon Lakes: these also form within the U-shaped valley.

- Moraine dammed Lakes: these are a result of glacial deposition of terminal moraine which traps water behind, to form moraine dams of melt waters

#### **c) Volcanic Lakes:**

\*Crater (Caldera) Lakes : these form when craters or calderas become sites of lakes when filled with water after volcanic eruptions .E.g on Bushokoro ,Muhabura, Karisimbi volcanoes , Lake Ngozi near Mbeya on Mt Rugwe with a depth of 75m in Tanzania ,Lake Nyungu and Lake Nyamununka in south western Uganda ;

\*Lava dammed lakes: these are formed when lava outflow across a river channel blocks the river water which becomes stagnant to form a lava dammed lake. E.g Lakes Ruhondo,Mutanda,Bunyonyi, and Kayimba in South Western Uganda.

\*Man-made Lakes: these are formed as a result of man's activity through dam Construction, mining and other related activities.

### **4. Features related to rivers in Africa**

#### **a.Work of Rivers / Functions Rivers**

Rivers perform three major functions : Erosion , Transport and deposition

- a) **Erosion work of rivers** : erosion involves the removal of geomaterials from the rocks and other deposited materials and depends on channel gradient, volume of water , velocity , Kinetic energy , water discharge , sediment load .
- b) **Transport by rivers** : is the movement of the sediment load of the rivers and include : gravels , sands , silt and clays .
- c) **Deposition by rivers** : it refers to the situation where a river drops its load due to reduction in its energy . the heavy load is selectively deposited the first while the fine and lighter last .  
N.B : Erosion and transport are dominant in the upper and middle course while deposition in the lower course / stage .

#### **b. River Erosion and its processes**

Erosion occurs where a stream has excess energy . The river erodes its banks and bed through four major processes through which river deepens and widens its valley .

- a) **Attrition** : this is the process through which eroded particles hit and collide with each other while in motion , they are reduced in the size , hence giving room for more erosion and consequently widening and deepening the river valley.
- b) **Corrosion ( abrasion)** : in the process , the sides and valley bed wear away by the load of the rivers . the load in motion hits against the stationary rocks on the valley sides and bed ( floor ) thus wearing and abrading the valley.
- c) **Solution ( corrosion )** or chemical action : this is the process through which the river valley is eroded by the solvent action of the water as it flows over the rocks . water dissolves the soluble rocks on the valley sides and bed hence carrying them away in solution .
- d) **Hydraulic action** : this is the process by which the river valley is eroded through the forcing of water into the cracks and joints of the rock.

#### **Erosional landforms**

The significant landforms resulting from fluvial erosion by streams include:

1. **River valley** : the valleys carved out by the rivers are significant erosional landforms  
Gorges and canyons : are very deep and narrow valleys with step sides / slopes

2. **Waterfall and rapids** : waterfalls or simply falls are caused by sudden descents or abrupt breaks in the longitudinal course of the river due to factors like :

- ✓ Variation in the relative resistance of rocks
- ✓ Relative difference in topographic reliefs
- ✓ Fall in sea level and related rejuvenation
- ✓ Earth movement

- Waterfall is a vertical drop of a big volume of water from a great height along profile of a river
- Rapids are much smaller than waterfall, they are found up stream from the main falls

**3.potholes** : these are kettle-like and cylinder-shaped depressions in the rocky beds of the river valley ; and are formed in coarse grained rocks (=sandstone and granites)

**4.benches** : the step-like flat surfaces on either side of the valley floor are called river terraces .

5. River terraces : the narrow flat surfaces on either side of the lowest valley floors are called river terraces of the rivers.

**6 . Meanders** : bends of longitudinal courses of the rivers.

**7.Peneplains** : low features less plains having undulating surfaces and remnants of convexo-concave residual hills . These are the end products of a normal cycle of erosion

### c. River transport and its processes

A river transports its load in four major processes. River load refers to the eroded materials being transported or deposited by river.

1.**Saltation** : in this processes , the smaller rock particles are carried along the river-bed in a series of hops and jumps as picked and dropped over and again . (= rough river bed )

2.**Suspension** : this is when small and light insoluble particles like silt are carried by water in a suspended form ( floats )

3.**Traction** : this is when big particles such as boulders and pebbles which can not be carried through the other processes are rolled on the valley bed . (= when valley bed is smooth )

4.**Solution** : this is when the eroded rocks get dissolved in water . they are carried away in a solution form.

### River deposition

Deposition of the load ( eroded materials ) occurs when the river has insufficient energy to transport its load any more . The material deposited is called **alluvium** .

River deposition results into the formation of the following feature :

i) **alluvial fans** : these are fan-shaped deposits of coarse alluvium , they are formed when a fast flowing river loses its velocity when it enters the plains

ii. **ox-bow lakes** : the lakes formed due to stagnation of water in the abandoned meander loops (=horse-shoe lakes = ox=-bow lake ) they are formed when a river develops pronounced meanders on the flood plains.

iii) **River meanders**

iv) **peneplains**

v) **Levees** : these are raised river banks made up of alluvium . they are formed when a river deposits its load during flooding .

vi . **deferred tributaries** : the raised nature of river banks stop tributaries from joining the main stream. They flow parallel to the main river until they encounter a break in the river bank where they now can join the main stream.

vii. **braided channel** : it is a wide and shallow channel where a river breaks into a series of interconnecting distributaries separated by sand banks and islands of alluvium . It is formed in the middle or old stage.

Viii. **Delta** : the depositional feature that is almost triangular in shape at the mouth of a river into either a lake or a sea . a delta is a low-lying swampy plain , which gradually becomes colonized by various types of plants.

## **5. The importance of rivers, lakes and wetlands in Africa**

### **a. River**

- ✓ Rivers and areas of water facilitates irrigation in agriculture ( farming )
- ✓ Areas of water serve daily domestic needs for drinking, cooking, construction
- ✓ Areas of water serve as navigation routes used in transporting people and goods.
- ✓ Some rivers have waterfalls. From these falls, barrages are set up produce electric Power.
- ✓ Areas of water serve as tourist sites.
- ✓ Areas of water contain fish serving s food for both humans and animals.
- ✓ Waters freshen the climate.

### **b. importance of lakes**

- Source of proteins and fact
- Source of raw materials for industries
- Tourist attractions
- Employment to man
- Act as political boundaries
- Sites for dumping waste
- Help to generate HEP
- Source of water for industrial and domestic use.
- Transport and communication avenues
- Source of minerals
- Revenue to the government.
- Modify local climate
- Reservoirs for irrigation schemes
- Place for breeding of wild animals
- Lakes regularise river flow

**c. Wetland:** A piece of wet, spongy land: low ground saturated with water.

1. They are source of water, 2. Natural water purification system, 3. Fishing activity, 4. Homeland for flora and fauna 5. Source of raw materials, 6. Provision of clay, 7. Source of food, 8. Grazing area, 9. Modification of climate 10. Source of medicine, 11. Reduction of occurrence of floods, 12. Recreational resource, 13. Sanctuary for birds

### **The relationship between human activities and areas of water**

Waters influence human activities.

#### **1° Industrial areas**

Some industries (factories), especially those consuming much water are planted near lakes, seas and rivers

e.g . Breweries, aluminium industries

#### **2° Favourite areas for tours and suburbs Installation of economic activities.**

thanks to harbour and piscicultural activities

#### **3° Installation of economic activities**

- People and goods transport
- Marine, lake and fresh water fishing, sand extraction
- Organisation of tourist activities.

#### **4° Scientific research sites / areas**

### **6. Challenges to obtain sustainable clean water in Africa**

1. Misuse of water resources, 2. Water pollution, 3. Soil erosion, 4. Development and construction, 5. Weeds and aquatic animals, 6. Straightening and dredging of rivers, 7. Climatic changes, 8. Urbanization. 9. Sewage and garbage disposal, 10. Water scarcity. 11. Silting/sedimentation.